57TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 335.

WATERWAY CONNECTING PUGET SOUND WITH LAKES UNION AND WASHINGTON, WASH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT IN RELATION TO THE WATERWAY CONNECTING PUGET SOUND WITH LAKES UNION AND WASHINGTON, WASH.

FEBRUARY 1, 1902.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, January 30, 1902.

SIR: I have the honor to transmit herewith, for the consideration of the Committee on Rivers and Harbors, a letter from the Chief of Engineers, United States Army, dated January 28, instant, submitting a special report of Maj. John Millis, Corps of Engineers, giving data in reference to the dimensions and cost of the waterway connecting lakes Union and Washington with Puget Sound.

Very respectfully,

ELIHU ROOT,
Secretary of War.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, January 28, 1902.

SIR: I have the honor to submit herewith a special report, dated January 10, 1902, by Maj. John Millis, Corps of Engineers, giving data in reference to the dimensions and cost of the waterway connecting lakes Union and Washington with Puget Sound.

The general project for this work originally adopted contemplated the construction of a ship canal connecting lakes Union and Washington with the waters of Puget Sound, and the estimated cost of a

single-track canal with composite locks was $2,316,167. The project contemplated locks 400 feet long, 50 feet wide, with a depth of 16.6 feet at low water, the cut to have a bottom width of 80 feet, which dimensions were regarded as ample at the time the first estimate was prepared.

The increased size of war vessels, and particularly the extraordinary dimensions of commercial vessels that are, or soon will be, running to and from the port of Seattle, have rendered the above dimensions entirely inadequate. In the Annual Report of the Chief of Engineers for the past few years reference has been made to a change of plans, and the amount required for the completion of the project was stated to be indefinite and uncertain. The dimensions for the locks that are now necessary are nearly twice as great as those contemplated when the first estimates were made, which will make the locks cost at least four times as much, and the cut itself will necessarily be correspondingly enlarged in depth and bottom width. In my annual report for 1901 I estimated that it would cost approximately $6,500,000 to complete the work of improvement in accordance with present requirements.

Major Millis is of the opinion that to make the proposed waterway available for naval and commercial vessels of present size and draft the locks should be 86 feet by 720 feet in clear dimensions of lock chamber, with 35 feet of water over the sills, and he submits an approximate detailed estimate of the cost of the improvement with locks of these dimensions. The total cost is placed at $6,331,672.

The detailed plans for this work have not yet been completed, and it is probable that, when all of the information is at hand, it may be found practicable and advisable to make some changes that will enable the completion of the improvement to be accomplished for less than the above estimate.

No appropriation has been made for the work by Congress since the passage of the river and harbor act of June 3, 1896, and as some action may be taken during the present session it is believed that all the information available should be before that body for consideration. I have the honor to recommend, therefore, that this report be transmitted to the Speaker of the House of Representatives for the consideration of the Committee on Rivers and Harbors.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers,
U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

UNITED STATES ENGINEER OFFICE,
Seattle, Wash., January 10, 1902.

GENERAL: 1. I have the honor to submit for your information the following data in reference to the dimensions and cost of the waterway connecting lakes Union and Washington with Puget Sound, as developed by the surveys and estimates made to date:

2. The total length of the axis of the canal from deep water in Puget Sound to deep water in Lake Washington is about 41,500 feet, or 7.86 statute miles. The detailed location is governed by the harbor lines

that have been established by Federal authority, extending from deep water in Puget Sound to the head of Salmon Bay, and by the land that has been donated by King County, Wash., for the site of the lower lock and dam, for the land cut between the head of Salmon Bay and Lake Union, and for the cut and lock site between Lake Union and Lake Washington.

3. On the south side of the western end of the canal the restrictions of the harbor lines are modified by the fact that the tide lands in that vicinity have been donated to the United States, and the Government has also been given title to a small tract on the north side below the lower lock site which the former location of the canal rendered necessary.

4. Harbor lines have also been projected in Lake Union by this office, but final approval of these lines is delayed by the desire of various interests that seek modifications. It is not likely that modifications materially affecting the canal as now projected will be made.

5. When the right of way was acquired the proposed canal section and lock dimensions were considerably less than those now contemplated. It was reported under date of August 21, 1900, from this office that "the right of way privileges and release from liability already secured are ample to permit the construction of a canal and lock [locks?] of the increased dimensions suggested within [substantially dimensions now proposed, but with somewhat larger locks and less depth of canal], and nothing additional to what has already been secured will be required." * * *

6. The linear dimensions for the locks that are now necessary are nearly twice as great as those contemplated when the first detailed estimates were made, and there are of course corresponding increases in the dimensions of the canal sections. The information regarding the nature of the material to be excavated is also more detailed now than was the case formerly. The dimensions now proposed are sufficient to accommodate the largest ships of the Navy and the largest commercial vessels now afloat or in contemplation that are likely to come to this port.

7. The depth in salt water, or from the western entrance to the basin below the lock, is 25 feet at extreme low water, affording a depth of 34 feet at lowest high water. The depth of the basin below the lock is 34 feet at extreme low water, which will enable a vessel of the greatest draft to lie at all stages of the tide. The depth from above the lower lock through to the upper lock is to be 35 feet below normal stage of Lake Union, at which level this portion of the waterway is to be maintained. The depth from above the upper lock to deep water in Lake Washington is to be 35 feet below average low water in Lake Washington. This level is about one-half foot higher than the lowest stage heretofore observed in Lake Washington, but this stage was reached with the small portage canal open.

8. Both locks to be single, 86 feet by 720 feet in clear dimensions of lock chamber, with 35 feet of water over the sills; both to have guard gates above and below and intermediate gates to make available one lock chamber 400 feet long and one about 270 feet long. The lift of the lower lock will vary with the tide from 7 feet to 25 feet. The lift of the upper lock will be from 7 feet to 13 feet, depending on the stage of Lake Washington. The lower lock will be built largely in a cutting on the north side of the channel. There will be a dam, with spillway, abreast of this lock, and a basin above as well as below, each about 300

feet wide and 900 feet long. The upper lock will be entirely in excavation at the "portage." No special works for regulating the level of Lake Washington are now contemplated at this point.

9. The detailed dimensions are as follows:

From western entrance to station 20 + 63:		
Length of axis	feet	2,063
Curve on radius of	do	2,604
Depth below extreme low water	do	25
Bottom width	do	300
Side slopes		1 on 3
Greatest depth of cut	feet	28
From station 20 + 63 to station 26 + 63:		
Length of axis	do	600
Straight reach		
Depth below extreme low water	feet	25
Bottom width, tapering from	feet	300 to 200
Side slopes		1 on 3
Greatest depth of cut	feet	29
From station 26 + 63 to lower end of lower basin at station 48 + 20:		
Length of axis	do	2,157
Straight reach and curve on radii of	do	1,719
Depth below extreme low water	do	25
Bottom width	do	200
Side slopes		1 on 2
Greatest depth of cut	feet	31
Basin below lower lock:		
Length	do	900
Bottom width	do	300
Depth below extreme low water	do	34
Side slopes		1 on 2
Greatest depth of cut	feet	40
Basin above upper lock:		
Length	do	900
Bottom width	do	300
Depth below normal water level of Lake Union	do	35
Side slopes		1 on 3
Greatest depth of cut	feet	15
From station 85, upper end of upper basin, to station 137:		
Length of axis	do	5,200
Straight tangents and curves, radii	do	1,719
Depth	do	35
Bottom width	do	200
Side slopes		1 on 3
Greatest depth of cut	feet	20
From station 137 to station 140:		
Length of axis	do	300
Straight reach		
Depth	feet	35
Bottom width, tapering from	feet	200 to 150
Side slopes		1 on 3
Greatest depth of cut	feet	24
From station 140 to station 150:		
Length of axis	do	1,000
Straight reach		
Depth	feet	35
Bottom width	do	150
Side slopes		1 on 3
Greatest depth of cut	feet	25
From station 150 to station 155:		
Length of axis	do	500
Straight reach		
Depth	feet	35
Bottom width, tapering from	feet	150 to 120
Side slopes		1 on 3
Greatest depth of cut	feet	25½

From station 155 to station 205. Land cut:

Length of axis	feet	5,000
Practically straight reach, one curve, radius	do	34,377
Depth	do	35
Bottom width	do	120
Side slopes:		
Stations 155–160		1 on 3
Stations 160–205		2 on 3
Greatest depth of cut	feet	59

(A modification of slope and possibly a retaining wall will be required for about 200 feet on one side of deepest cut, unless streets are graded before excavation is completed.)

From station 205 to station 343, Lake Union:

Length of axis	feet	13,800
Curves and straight reaches. Radii of curvature	feet	1,719 and 1,910
Depth	feet	35
Bottom width	do	250
Side slopes		1 on 3
Greatest depth of cut	feet	35
Total length of dredged cut in Lake Union	do	6,900

(Side slopes and bottom width will be slightly modified near Latona Bridge.)

From station 343 to station 369. The Portage Cut:

Length of axis	feet	2,600
Straight reach		
Depths below Lake Union level and average low water Lake Washington level	feet	35
Bottom width:		
From station 343 to station 345, tapering from	feet	250 to 120
From station 345 to station 355		Lock.
From station 355 to station 364	feet	120
From station 364 to station 369, tapering from	feet	120 to 200

Side slopes:

From station 343 to station 345, 1 on 3 to 2 on 3.

From station 355 to station 364, 1 on 3 to 2 on 3.

From station 364 to station 369, 2 on 3 below berm 10 feet wide, 6 feet under water; 1 on 1 above berm 10 feet wide, 6 feet under water.

From station 369 to station 415, Union Bay, Lake Washington:

Length of axis	feet	4,600
Curves and straight reaches. Radii of curves	feet	5,730 and 6,876
Depth	feet	35
Bottom width	do	200
Side slopes		1 on 3
Greatest depth of cut	feet	31

Estimates.

Excavation below lower lock, 1,939,000 cubic yards, at 50 cents per cubic yard	$969,500
Hard clay, sand, gravel, cemented gravel, and bowlders; will probably have to be taken out mainly with powerful dipper dredges, and some bowlders will have to be drilled and blasted. Material can be disposed of on submerged tide lands near and in deep water of Sound.	
Lower lock and dam complete	1,718,000
Excavation will be clay, sand, gravel, and hardpan. Foundation probably all on hardpan.	
Excavation between lower lock and head Salmon Bay, 1,188,000 cubic yards, at 30 cents per cubic yard	356,400
Material generally soft on top, harder below; easily disposed of on adjacent lands that will be submerged after completion of dam. Top material can be handled by hydraulic dredgers. Dipper dredgers will be required for lower portions of cut.	
Excavation between head of Salmon Bay and Lake Union, 1,206,400 cubic yards, at 33 cents per cubic yard	398,112

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Material generally not difficult to excavate—sand, gravel, and clay. It can readily be disposed of on adjacent submerged lands. Can be largely handled with hydraulic plant.		
Excavation in Lake Union, 1,298,600 cubic yards, at 25 cents per cubic yard		$324,650
Material generally soft. Disposal will be more expensive than in Salmon Bay. Can be largely handled with hydraulic plant.		
Upper lock, complete		1,270,000
Excavation hard clay and gravel mixture. Foundation probably all hardpan.		
Excavation in the portage cut, not including that for lock, 401,800 cubic yards, at 50 cents per cubic yard		200,900
Material hard clay and gravel. Hydraulic plant not applicable.		
Excavation in Union Bay, Lake Washington, 1,213,700 cubic yards, at 30 cents per cubic yard		364,110
Material generally soft and easily disposed of in deep water of Lake Washington. Can be largely handled with hydraulic plant, probably. Borings not yet made.		
Total		5,601,672
Contingencies, 10 per cent		560,000
Total to be appropriated		6,161,672
Cost of excavation provided for under previous appropriation	$118,600	
Reserve for surveys, plans, etc., under previous appropriation	51,400	
		170,000
Estimated total cost		6,331,672

The unit price for excavation between Salmon Bay and Lake Union is made somewhat high in view of possible necessity for revetting sides along part of this cut.

A tracing showing in outline the main features of the canal accompanies this report.

Very respectfully, your obedient servant,

JOHN MILLIS,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

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